CENTRAL ATLANTIC REGIONAL ECOLOGICAL TEST SITE (CARETS): A PROTOTYPE REGIONAL ENVIRONMENTAL INFORMATION SYSTEM

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a. Central Atlantic Regional Ecological Test Site: A Prototype Regional Environmental Information System. (ERTS-A Experimen SR-125).

b. IN-002 (NASA investigator identifier)

c. Problems impeding progress of the investigation.

Converting the ERTS and aircraft derived land use data into digital form has been a more difficult problem than had been anticipated. Ideally the availability of ERTS data in digital form on the computer-compatible tapes should be a big step toward digital processing. But this investigation requires bringing together several other environmental data sets for comparison, including a land use data set from Level II maps at 1:100,000 keyed to UTM coordinates. Also, software for transforming ERTS tapes into reliable land use maps is not available thus far to this investigation. Therefore, it has been necessary to employ a combination of manual interpretation and graphic techniques as interim steps before digitizing and follow-on data processing tasks can be performed. These interim steps are cumbersome and time-consuming, and in the view of this investigator could more efficiently be performed either by the NASA-Goddard National Data Processing Facility or by a dedicated centralized computer facility than by an individual ERTS investigator. The effects on this investigation of these difficulties in "mapping" the ERTS data are delays in the analysis and environmental interpretation of the results, the tasks that the CARETS team members are best qualified to do.

d. Accomplishments during the reporting period and those planned for the next period.

Images representing 19 ERTS MSS scenes were received for the area of the CARETS test region during the period of this report. Dates of the ERTS images ranged from May 31, 1973, to July 24, 1973. Thus on the average over a two-month period, the delivery to the investigator is just a little over a month after satellite pass, the best record for the investigation thus far. Each of the images was examined for identification of land use types using the land use classification scheme being tested in the CARETS project. Encouragingly large numbers of categories were identified on most images. Because it was felt that communication of these categories to other investigators or users might be more appropriate in the "land use" discipline than the large list of standardized descriptors, we elected to substitute our list of land use descriptors (based on USGS Circular 671 plus some third level categories) for the regular image descriptors previously used (see section i. below). In addition, we are seeking feedback from readers of this report regarding use of the image descriptor system thus modified, and regarding desirability from a user standpoint of increasing the spatial resolution of reporting on image descriptors. Further details on the requested feedback are contained in section e. below.

Other accomplishments during this reporting period can best be understood by reference to the list of tasks presented in the Type II Progress Report dated 1 July 1973. (Table 1, page 4).

Task 3: Prepare maps and mosaics for open file release: Because so many of the other tasks are dependent on the successful completion of this one, the major portion of the effort during this reporting period was devoted to this task. Preparation of all but 6 of the 96 marginal "collars" for the 1:100,000 scale land use maps and photomosaics containing required indexing, legend, and geographic reference information, was completed during this reporting period. Unedited manuscript maps were completed for each of the required maps sheets and overlays at 1:100,000 for the entire test region; editing of those sheets was approximately half completed. Completion of the entire preparation of maps and mosaics for open file release is still planned for the next reporting period.

Task 5: Prepare "filler" mosaics from U-2 photography: Except for a small portion of the western edge of the test region, for which high-altitude aircraft coverage was never obtained, the preparation of "filler" mosaics of the region was completed during this reporting period.

Task 9: Update Level II aircraft (U-2) data base: The updated maps (land use change maps) were completed during the period of this report except for those areas which were missed by both the RB-57 and U-2 missions of 1970 and 1972 over the CARETS region. It is expected that the U-2 coverage requested during the early fall of 1973, plus photography from non-NASA sources to fill the gaps in the 1970 data base, will enable completion of this task before the end of the calendar year. Discussions relating to the aircraft mission requirements were held with NASA Wallops Station and aircraft program personnel.

Task 15: Digitize 1970 Level II data base: Progress on this task has been slower than expected. The large size of the job (involving almost 300 separate map sheets for Tasks 15 through 21) has necessitated a most careful investigation into methods that would be economically feasible for data from the whole test region. A request for proposals, to seek bids from industry, was prepared. Also, CARETS team members digitized the land use data from most of Priority Sub-region I, using a Bendix datagrid digitizer made available through the courtesy of the USGS Topographic Division. A thorough understanding of the difficulties, as well as the potential, of this method resulted from this effort. Plans for the next reporting period include continuing to experiment with methods of hand digitizing using available USGS equipment, as well as pursuing ways of getting the bulk of the digitizing accomplished at some external facility.

Tasks 16 through 21: Digitizing other map sheets: Completion of the other digitizing tasks were similarly delayed, awaiting results of the efforts mentioned above. It is expected that all the digitizing tasks for Sub-region I should be completed during the next reporting period.

Task 23: Obtain user evaluations: Contacts with users and potential users of the CARETS products continued during this reporting period. The Baltimore District, Corps of Engineers, received a preliminary set of CARETS land use maps to be used as data support for a study of future requirements and land use impact of Corps projects in the region. The Northern Virginia Planning District Commission evaluated CARETS data and received advice on how such data could be used in assessing carrying capacity of land subject to developmental pressures. Discussions and

data exchange took place between CARETS team members and staff of the Interstate Commission on the Potomac River Basin, concerning the land use data derived from ERTS for a gross assessment of the probable effects on runoff and water quality in the Potomac Basin. Other discussions took place with the Metropolitan Washington Council of Governments, the National Park Service, the University of Maryland Department of Agricultural Economics, the Department of Physics at Old Dominion University.

e. Scientific results and practical applications.

Our assessment of the accomplishments achieved during the period of this report gives us every reason to believe that we are on the right track in conducting the CARETS ERTS investigation in a regional information systems framework. The hard scientific results and practical applications will necessarily await the completion and prototypical operation of the information system with user feedback in the last few months of the investigation. These results do not fall out neatly in packages at times of the two-month progress reports.

An information system depends on viable linkages and user feedback, as well as on the quality of the information inputs and the fidelity of information transfer at each step of the information flow. One of the possible linkages which has not been sufficiently explored is the tie to NASA and EROS participants through the mechanism of these progress reports. Within the progress reports probably the most easily coded and quantifiable information items are the image descriptors.

The identification of a land use as being present within a single ERTS frame, and making that identification available through the image descriptor system, might be a first step in channeling to prospective users a flow of interpreted information derived from ERTS images. Such a rudimentary land use information system would have a very coarse spatial resolution, since the location identifier for each descriptor is the area of the entire ERTS image. Depending on the balance between user demand and operating costs, the system could be refined in several stages, for example adding an identifier as to which quarter, ninth, sixteenth, twenty-fifth, etc., of the image the particular land use type was located in. The ultimate in spatial and temporal resolution possible in such a system would be achieved by recording and transmitting a land use descriptor for each pixel of each ERTS image, but it is doubtful if there would be users for that quantity of information or if any system could bear the costs. Therefore, there must be some compromise that could be achieved by smoothing or aggregating the interpreted land use information both spatially and temporally, or, alternatively, by sampling at prescribed intervals in space and time.

We are hereby calling for response from readers of this report and users of the image descriptors. We will consider this reponse as a test of the viability of the information links between the CARETS investigation and the users of the NASA image descriptors. Specifically, we ask that the respondents simply fill in the information and/or check the appropriate blanks in the following list of information items requested.

INFORMATION REQUESTED FROM USERS OF ERTS IMAGE DESCRIPTORS IN CENTRAL ATLANTIC AREA

1. Name, address, and organization of respondent.

2. Reason(s) for wanting land use information.

3. Acceptable spatial resolution of interpreted land use information from ERTS. (The information would be provided by image descriptor system or by modifications of same as described in text. Check more than one if appropriate.)

   (a) Single ERTS frame _____

   (b) Fraction of ERTS frame (quarter, ninth, etc.: specify which) _____

   (c) Grid cell 1 km. on a side _____

   (d) Grid cell 500 meters on a side _____

   (e) ERTS - CCT pixel _____

   (f) Other (specify) _____

4. Acceptable temporal resolution of interpreted land use information from ERTS. (How often do you really need to have the information--and/or have it updated?)

   (a) Every 18 days _____

   (b) Once a month _____

   (c) Quarterly _____

   (d) Annually _____

   (e) Other (specify) _____

5. Geographic area of interest.

   (a) Pennsylvania _____

   (b) New Jersey _____

   (c) Delaware _____

   (d) Maryland _____

   (e) Virginia _____

   (f) District of Columbia _____

   (g) Other (specify) _____

6. Have you ever used the ERTS image descriptor system?

Interested respondents are asked to send replies to:

Robert H. Alexander
Principal Investigator, CARETS Project
Geographic Applications Program
U. S. Geological Survey
Reston, Virginia 22092

Results of this inquiry will be useful in planning for the detailed analysis of the ERTS images received during the remainder of this investigation, and for deciding how much effort to put into the ERTS image descriptor system in future reports. Feedback from this interrogation of the rudimentary ERTS information system will be reported in future progress reports.

f. Published reports or talks.

None.

g. Recommendations for improvement:

None.

h. Changes in standing order forms:

None.

i. ERTS image descriptor forms:

See attached.

j. Data request forms submitted:

k. Status of data collection platforms (if applicable):

N/A

FOLDOUT FRAME 1

CARETS LAND USE CATEGORIES DETECTED BY ERTS	IMAGES RECEIVED July-August 1973	5/31/73 1312-15082	6/1/73 1313-15134	6/1/73 1313-15141	6/2/73 1314-15195	6/2/73 1314-15201	6/2/73 1314-15204	6/3/73 1315-15262	7/6/73 1348-15073	7/6/73 1348-15080	7/6/73 1348-15082	7/7/73 1349-15132	7/7/73 1349-15134	7/7/73 1349-15141	7/8/73 1350-15183	7/8/73 1350-15190	7/8/73 1350-15192	7/8/73 1350-15195	7/9/73 1351-15253	7/24/73 1366-15072
1. URBAN		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11 Residential			X		X	X			X			X	X	X			X	X		X
111 Single-Family Residential Units			X		X	X			X			X	X	X			X	X		X
15 Transportation-Communication		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
151 Highways		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
152 Railroads & Facilities		X	X	X	X		X	X	X				X	X	X	X	X	X		X
153 Airports		X	X	X	X				X			X	X	X		X	X	X		X
154 Marine Craft Facilities				X	X	X			X			X	X	X			X	X		X
16 Institutional		X	X	X	X	X	X		X	X	X			X			X			X
17 Strip & Cluster			X	X	X	X	X		X	X		X	X	X		X	X		X	X
18 Mixed		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X
19 Open and Other			X	X	X	X	X		X			X	X		X	X	X	X		X
2. AGRICULTURAL		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
21 Cropland & Pasture		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4. FOREST		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
41 Heavy Crown Cover		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
42 Light Crown Cover		X		X		X	X	X	X	X	X	X	X	X	X	X		X	X	X
5. WATER		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
51 Streams & Waterways		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
52 Lakes		X	X	X		X	X	X	X	X		X	X	X	X	X		X	X	X
53 Reservoirs		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
54 Bays & Estuaries		X	X	X	X	X	X		X	X	X	X	X	X		X	X	X		X
6. NON-FORESTED WETLANDS		X	X	X	X	X	X		X	X	X	X	X	X			X	X		X
61 Vegetated		X	X	X	X	X	X		X	X	X	X	X	X			X	X		X
7. BARREN LAND		X		X		X			X	X	X	X	X	X			X	X		X
74 Beaches		X		X					X	X	X	X	X	X			X	X		X

ERTS IMAGE DESCRIPTOR FORM

USER NAME ROBERT H. ALEXANDER DATE September 1, 1973
USER ID IN-002
AGENCY U. S. Geological Survey (GAP)

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS

CARETS LAND USE CLASSIFICATION DESCRIPTORS

Instead of presenting the standard ERTS descriptor forms for the imagery received during this reporting period, we are submitting a descriptor matrix derived from three levels of the land use classification scheme used in the mapping of CARETS as an experimental alternative which may prove of value to CARETS users. The single digit categories are those of Level I; two digit categories belong to Level II; and three digit categories are those of Level III. The matrix does not include all possible categories for the three levels of the classification but rather only those detected on at least one of the ERTS images received during July and August, 1973. We request that copies of this report be made available to users of the image descriptor system for images lying within the CARETS test region. For further details on our desired feedback from users of the descriptor system, please refer to section e. above.

*FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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